



## TURBINE QUALITY ASSURANCE PROGRAM UNIT 1 MARCH 2003

### PRELIMINARY WORK SCOPE

Updated on 10/29/02

#### Preoutage Meeting

- Date January 21, 2003
- Place Conference 4, IPSC site
- Attendants Alstom, MD&A, Continental, Primachine, IPSC

#### Outage start date

Unit off line after peak Friday night Feb 28, 2003

Work start Saturday day shift March 1, 2003

#### End date

Available for full load, Monday March 31, 2003

Work cards in Friday March 28, 2003

28 work days available

#### Personnel

##### Maintenance

- Mike Alley Turbine Outage Manager
- Craig Teeples Day shift Supervisor
- Will Lovell Night shift Supervisor
- Richard Houston Maintenance Engineer
- Kelly Cloward Maintenance Planner

##### Technical Services

- James Nelson Supervising Engineer
- Phong Do QA/QC Day shift
- Dave Spence QA/QC Night shift

##### Manpower

- Shift hours 12 hrs/shift, 24 hrs/day, 7 days/week
- Crewman

#### Work scope

##### HP Turbine

- HP turbine upgrade
- N1, N2 retractable packing
- Tops on/Tops off alignment (Alstom/Laser Services)
- HP extraction pipe cutting and welding includes R-Stamp code welding procedures, preheat, postheat and restrain rigging procedure. (Irwin)
- HP leak off (IP cooling) pipe cutting and welding includes R-Stamp code welding procedures, preheat, postheat and restrain rigging procedure. (Irwin)
- Cut and welded cap the existing 1<sup>st</sup> stage thermocouple on the HP, L/H, outer shell, (Irwin.)
- Cut and welded cap the existing 1<sup>st</sup> stage pressure sensor line. (Irwin)
- Drill tap and install new thermocouples on steam leads and outershells (1 on top 1 on bottom.) (Continental, IPSC)
- Prior to removing of top half, check the line-up of the N1 and N2 balance planes (between the end access hole with the Ns packing casings).
- Possibly field drill and tap and install new plugs to correct the N balance planes with the new rotor (Continental, IPSC)



## TURBINE QUALITY ASSURANCE PROGRAM

### UNIT 1 MARCH 2003

#### IP Turbine

- IP overhaul
- 8<sup>th</sup> stage installation and shell fit rings adjustment.
- Cut 8<sup>th</sup> stage root radial spill strips to correct diameter (approx 38.333" dia)
- Cut 8<sup>th</sup> stage shell fit seal rings to correct dimension
- IP cooling steam snout rings installation
- Tops on/off alignment (IPSC/Laser Services)
- Boresonic inspection
- Steam path audit
- Low speed rotor balance
- Diaphragm retractable packings installation

#### Front Standard & EHC

- PMG overhaul
- Replacement/overhaul MTV, MLV, ETV, ELV, MTSV, ORSV, OTSV, ARDV's, ETSV, ORP, MTP
- Repair low speed switches in front standard
- EHC line up

#### Instrumentations and Control

- Install two (2) HP inlet thermocouples on the steam lead U/H, R/S with support to replace the existing 1<sup>st</sup> stage thermocouple.
- Verify and complete installing the two pressure connections on the HP inlets on steam lead #3 and #4 for testing and for replacing the existing 1<sup>st</sup> stage pressure. The 1<sup>st</sup> stage pressure transmitter may require re-ranging to suit the higher pressure (IPSC) in according with ALSTO flow/pressure curve TS 29367. Steam lead pressure tabs on CV3 and CV4 (north end top and bottom leads) with CV4 pipe runs to the PT cabinet, with double isolation valves and weld cap - IPSC
- Install two (2) thermocouples with support, 1 on the top-midspan of the U/H HP shell and 1 on the bottom-midspan-15degree off centerline on the L/H HP

#### Lube and Steam Seal

- Full flow filters - replace filter elements
- Overhaul steam seal regulator
- Clean lube tank

#### Valves

- Overhaul all MSV includes Mag Particle Test (MT) of all valve casings and upper heads
- MSV2 and MSV4 valve seats pull out for inspection and NDE.
- Install startup screens on all the main MSV
- Install startup screens on the BFPT HP stop valves
- Overhaul all CV includes MT of all valve casings and lower stands, linkage inspection, operating rod adjustment.
- Overhaul CV2 & 4's control pac.
- Overhaul CV2's actuator's spring can
- CV wire and card change out
- Valve test
- Valve lineup on roll down and roll up
- Overhaul all Equalizer Valves, Ventilator Valves (use Irwin to disassembly valve)



## TURBINE QUALITY ASSURANCE PROGRAM

### UNIT 1 MARCH 2003

---

- Replace/inspect CRV screens
- Overhaul turbine extraction check valves

#### Couplings

- Control coupling remachining. Keeping the rabbet fit.
- "A" coupling, TE, on-lathe coupling line bore, eliminating the current rabbet fit, use new hydraulic sleeves and use the same bolts.
- Possibly "A" coupling half, GE, true up.
- "B" coupling, on-machine line bore, replace the existing hydraulic bolts and nuts with an upgraded set per Avoko recommendation.
- Possibly "B" coupling true up.

#### Generator

- Vacuum/Pressure test
- Grind collector rings-turning gear
- Remove upper-outer end bells for inspection/repair
- Possible repair of stator leak
- Electrical testing
- Generex

#### Boiler Feed Pumps, BFPT and Valves

- Overhaul A and B BFP volutes w/ performance upgrade.
- Overhaul BFPT controls on both A & B
- Install startup screen on the high pressure stop valves of both A & B BFPTs.

#### Other Systems

- The U1 A and B cooling tower blades inspection
- The U1 A, B, C condensers inspections

## TURBINE QUALITY ASSURANCE PROGRAM

### UNIT 1 MARCH 2003

---

#### Reminder Lists

##### QA

- Use Alstom record sheets for the HP
- Work with performance group for thermal mapping of the HP & IP U//H, L/H outer shells mapping. (PTD)
- Except for the HP, use IPSC record sheets for all others unless other wise approve by IPSC.
- Update torque values for the valves, diaphragms and shell bolts.
- No need to perform the opening coupling alignment at the hot condition. The opening coupling alignment should be done with tops on, on building keys during the "reassembly" process. Readings will be more accurate as the components are at room temperature.
- Coupling and journal concentricity checks should be done on the machine with tops on, at "closing" and at room temperature. The associated bearings should be wedged LS and RS, and indicators should be mounted on top.
- For the bearing alignment, the as found U2 B coupling turbine half is 0.014" low to the generator half. GE design called for the B coupling turbine half to be at 0.027" low to the generator half (the periphery check will show a 0.054" difference.) **IPSC historical data shows that the B coupling turbine half should be kept between 0.014" to 0.021" low to the generator half (or the periphery check will show a 0.028" to 0.042" difference) measuring at ambient condition, tops on, on running keys.**
- Review and correct the Non Return Valve QA for each individual valves. As of now all the valve, regardless the size, having the same specification and clearances.
- Perform rim and face true up, if possible, on both A and B coupling on U1.
- Perform concentricity alignment and adjustment on bearing journals.
- All TD shall be on site 1 month prior to the outage to discuss the work scope and QA.

##### HP

- Need to work with Primachine to improve tooling and quality of work on the N1 packing head machining.
- Ensure that Alstom will provide proper control rotor coupling holes and bolt circle to match with the existing GE rotor coupling of 12 mounting holes and 4 jack holes.
- Ensure that the Steam Path Company's schedule of delivery on the N1 and N2 packing head and casing rings is on time. They were 3 days late.
- Ensure the machining quality of the N1 and N2 packing head and casing seal rings. Some of the teeth were bent. Consider to order the parts from Turbocare.
- Ensure proper premachining of the IP 8<sup>th</sup> stage cooling snout ring assembly from Turbocare.

## TURBINE QUALITY ASSURANCE PROGRAM

### UNIT 1 MARCH 2003

- Properly mark and machining of the A coupling key phase. (IPSC & Continental)
- Use tri-tool to cut the 4<sup>th</sup> stage extraction between the 2 existing field weld then rig the pipe out the way.
- Use tri-tool to cut the IP cooling pipe length to match with the Alstom supplied IP cooling pipe length.
- Remark A coupling GE haft to match the new coupling TE half.
- Redrill and match the N2 packing casing Balance Access hole to the HP rotor balance hole centers. The performance group had tough time to install balancing weights at startup. Build and install new pluggs as needed.
- Ensure to obtain the balance weights for the HP rotor and bullet thread hole tap tool from Alstom.
- Prepare for the contractor to add additional blanket on the HP outer shell upper half to keep both U/H and L/H the same shell temperatures.
- Do not insulate the HP new 1<sup>st</sup> stage lines below the platform for the required condensation.
- Ensure that Continental is prepared the tools and drive plates to true up the A and B couplings on both TE and GE half, as needed.
- Prepare for measuring and machining the U1 steam lead flanges.
- Work with Bill M. to obtain a removable HP outer shell thermo couples.
- Preorder parts:
  - 4<sup>th</sup> stage extraction (part H - 1 each) - New bolts and gasket
  - IP cooling (part K - 1 each) - New bolts and gasket
  - 1<sup>st</sup> stage pressure tap connection (part B - 2 each) - New bolts, new blinded flanges and gaskets.
  - 1<sup>st</sup> stage thermocouple holders (part F - 1 each) - New bolts, new blinded flanges and gaskets.
  - ½" P22, schedule 160, 10ft long, pipe for the new thermo couple nipples.

#### Front Standard

- Stock the o-ring that leaked on March 2002 U2.

#### IP

- Good sandblast and cleaning of the inner and outer shells and fits
- Good cleaning of the horizontal joins
- Clean all bolts and stud right after the shell remove
- Remove all interstate and N packing rings prior to sandblasting.
- Reconsider the need for low speed balance.
- Provide a more specific instruction and component name list to the NDE and blast cleaning contractors.
- Ensure a more accurate machining, tigh tolerance and parallel at the interface surfaces of the IP 8<sup>th</sup> stage refurbishing.
- Ensure a more accurate and completed machining of the IP 8<sup>th</sup> stage cooling snout rings and assembly



## TURBINE QUALITY ASSURANCE PROGRAM

### UNIT 1 MARCH 2003

- Monitoring diaphragms twisting and dishing at the IP 9, 10 and 11 stages.
- The IP U/H inner shells should be reassembled from one end only (NOT BOTH ENDS) or preferably with the center section installed first.
- Blast clean and stone all fits between the inner and outer mating surfaces and the HJ holes.
- Preorder a full set of the IP diaphragm support shim screws.

#### Generator

- Perform valve walk down and snooping while in the air equivalent test
- Make sure to install the gasket on hydrogen seals

#### Bearings

- Ensure to use Grade 2 babbitt material for babbitt repair. The grade 2 will improve the babbitt bonding.

#### Control Valve, Main Stop Valve and CRV

- Ensure to readjust the push rods on the CV to have the transducer scribed line match up with the control pac flange.
- Prepare weld repair on the CV (talk to Rick H.)
- Start the inspection early on the ventilator and equalizer valves
- Ensure the CRV signal are adjusted for full open (Bill M.)
- Consider to shortening the MSV and CRV outage interval from the existing 5 years to 3 years. The valve's strainer baskets in both CVR and MSV felt apart causing significant damages and FOD on the IP's diaphragms. See MD&A report (Rick H.)
- Arrange outage schedule to allow stroking and functional testing of the turbine non-return check valves. This would ensure the operation of the turbine water induction protection.
- Use Novatech for Unit 1 valve card change out, valve and EHC line up.
- Install portable handrail and catwalk east side the frond standard for safety (Jerry H.)
- The front standard air dump valve o-ring need to be pre-ordered (Jim K.)
- Adjust valve curve to prevent valve swing at low load (650MW)
- Install and remove all MSV startup screens
- Consider to install the startup screen DP monitor.

#### Extraction Non-Return Valves

- Review the last U1 outage to identify punch list.
- Possible preorder all required parts (shaft, bushing, arm, disk...) for the big UV TEA 10 and TEA11.

#### BFP & BFPT

- No need for other pumps barrel mapping
- Perform discharge nozzle UT. Ensure not to drop tools into pipe.
- Ensure proper drilling of the oil supply ports, proper drilling and plugging of the last tooth labyrinth seals, proper positioning of the anti-rotation pin holes, sight

## TURBINE QUALITY ASSURANCE PROGRAM

### UNIT 1 MARCH 2003

---

glasses

- Ensure proper vane orientations of the upgrade pumps.
- Ensure proper bearing oil flow orifices.
- On the BFP mark "No 1", ensure to remove the chrome area on the shaft where the oil deflector screws set in.
- Install and remove startup screens

#### Contractors

- Clear instruction, specification and record sheets for all of the NDE work.
- Clear instruction, specification and record sheets for all of the sandblast work.
- Completed report and data recording from Primachine on the valve work.
- Better tooling and scheduling from Primachine on the N1 packing head work.

#### Tools

- Bolt stretching tool and rod should be marked
- Extensionometer should be adequate and calibrated
- All dial and digital indicators should be calibrated.
- New, smaller scale and accurate main oil pump steady bearing dynamometer should be available.
- Obtain the N balance hole thread chaser from Alstom.



## TURBINE QUALITY ASSURANCE PROGRAM

### UNIT 1 MARCH 2003

#### Contractors

• Alstom	Technical direction HP
• Laser Service	HP/IP Alignment
• MD & A	Technical direction IP and valves
• Continental Field Systems	Onsite machine work
• Midwest Turbine Inspection	Sandblasting
• Mannings USA	Induction bolt heating
	Shell closing system
• Reinhart & Associates	NDE
	Rotor Boresonic inspection/NDE
• General Electric	Collector ring grinding
	MAGIC inspection
• MD & A	Vacuum/pressure test
	Steam path repair
• IPSC	Electrical testing
• Prime Machine	Low speed balance IP rotor, N1 packing head
• Erwin/IPSC	HP Extraction welding/BFP MBV10 welding
	Valves disassembly
• Turbocare	Retractable Packings, IP snout rings
• NovaTech	EHC/Valve line up, valve testing





## TURBINE QUALITY ASSURANCE PROGRAM UNIT 1 MARCH 2003

### Turbine Coordinating Meeting Action Items

Description	Responsible Party	Dead Line	Comments
Check the size of A coupling hole and sleeve extra stock	Kelly/Phong/Avoko	Jan 2002	
N1 packing head machining method	Kelly C/Continental	Jan 2002	
Thermo couple nipple material and size Who will supply them?	Phong/Alstom	Jan 2002	
Card change out procedures and wiring	Phong/Alstom	Jan 2002	
NovaTech installation support commitment	Phong/Alstom/NovaTech	Jan 2002	
NovaTech EHC and valve lineup rolldown and rollup support	Phong/Bill B/NovaTech	Jan 2002	
Class schedule and agenda. Tentatively 4 days, week of Feb 11th	Phong/Alstom	Jan 2002	
Control valve discrepancy	Phong/MD&A	Feb 2002	
IP Topless alignment; required readings, schedule	Kelly/Alstom/Alignment Service/MD&A	Jan 2002	
A and B coupling drawings to Continental	Phong/Continental	Jan 2002	
New machine drawing	Alstom/Phong/Continental	Jan 2002	Forwated to KC to Cont.
New time line and critical path	Alstom/Phong/Continental	Jan 2002	
Current vibration data	Phong/Aaron/Alstom	Jan 2002	
QA Sheet	Phong/Alstom/MD&A	Jan 2002	
Collector ring grinding method reevaluation	Phong/Jon C/Continental	Jan 2002	
Extraction pipe cutting and welding	Phong/Bob A/Irwin	Jan 2002	



# **TURBINE QUALITY ASSURANCE PROGRAM** **UNIT 1 MARCH 2003**

Description	Responsible Party	Dead Line	Comments
Existing 1 <sup>st</sup> stage pipe cutting and welding	Phong/Dean/Dale H	Jan 2002	
CV3&4 welded tap	Phong/Dean/Dale H	Jan 2002	
Existing thermo couple hole and pipe welded plug	Phong/Bob A/Irwin	Jan 2002	
HP shell, IP cooling pipe cutting and welding	Phong/Bob A/Irwin	Jan 2002	
List of attendees	Phong/Alstom	Current	



## TURBINE QUALITY ASSURANCE PROGRAM UNIT 1 MARCH 2003

### Outage Punch List

This list summarizes the required items that need to be done prior, during and after the outage.

No	Priority	Description	Assigned To	Date Noted	Date Completed	Comments
1	1	Record all of the HP & IP interface key, shim (packers) and obtain associated drawings.	Phong Do			
2	1	Update the HP Turbine Key Identification List	Phong Do			
	1	Control valve adjustment?	Phong Do		3/27/02	
	1	Main stop valve cap and disk retorque and pinning on the disk bolt.		3/1/02	3/16/02	
	1	CV4 Hydraulic park attachment rod broken. Need to be redrill and tap.	Kelly C	3/3/02	3/16/02	
		MSV#2 disk bushing vs inner stem clearance	Phong Do	3/3/02	3/4/02	Completed
		1 <sup>st</sup> stage pressure instrumentation and testing tabs piping and valves installation	Dean W.	3/4/02	3/27/02	
		CRV hanger block rework	Graig Teeple	3/4/02	3/25/02	Completed
	1	U/H HP I/S vs O/S on line balancing access	Phong Do	3/5/02	3/27/02	Completed
		A coupling phase reference	Berry Ingle	3/3/02	3/27/02	
		T2, T4 bearing damage, need to talk to determine the causes.	Phong Do	3/5/02	3/27/02	
		Will need second set of IP rotor run out reading to determine the cause and resolution.	Phong Do	3/5/02	3/7/02	Done



# **TURBINE QUALITY ASSURANCE PROGRAM** **UNIT 1 MARCH 2003**

No	Priority	Description	Assigned To	Date Noted	Date Completed	Comments
		T13 pad correction		3/13/02	3/19/02	
		HP LS steam lead flange correction		3/13/02	Not Done	
		BFP steam erosion correction		3/13/02	3/15/02	
		IP 8 <sup>th</sup> stage warming line snout ring correction		3/13/02	3/15/02	
		MSV#2 seat correction		3/13/02	3/14/02	
		Check clearance and inspect the CV linkage at "Point 8"				
		Control rotor coupling run out			3/27/02	
		T13 U/H mid pad damage		3/10/02	3/20/02	
		IP TE coupling half TIR is high. Need to correct both rim and face	Phong Do	3/7/02	Not Done	
		T11 babbitt damages	Phong Do	3/6/02	3/19/02	
		CV2 and CV4 seat cracks. Lap and re-NDE	Phong Do	3/6/02	3/23/02	
		BFP Pen dropped removal			3/25/02	



**TURBINE QUALITY ASSURANCE PROGRAM**  
**UNIT 1 MARCH 2003**

No	Priority	Description	Assigned To	Date Noted	Date Completed	Comments



**TURBINE QUALITY ASSURANCE PROGRAM  
UNIT 1, SPRING 2003**

---

**Turbine Welding Support (Contact Phong Do)**

1. Cut and weld the existing 4<sup>th</sup> stage HP extraction pipe line, 12", ASTM A335, Grade P11, Schedule 80, includes code welding, pre-heat, post-heat, restrained rigging, and shot blast cleaning. Radiographic exam all welds.
2. Cut and weld the existing HP/IP cooling pipe line, 2.5", ASTM A335, Grade P11, Schedule 160, includes code welding, pre-heat, post-heat, restrained rigging, and shot blast cleaning. Radiographic exam all welds
3. Cut and remove the existing 1<sup>st</sup> stage thermocouple-well on the HP, 3 each, lower half, outer shell. Install new bolts and new blind flange to plug the holes.
4. Weld two new thermocouples on the HP steam lead #1 (looking west, top pipe, left side) as according to R200/A0/10325.
5. Cut and remove the existing HP 1<sup>st</sup> stage pressure sensor line, 1", ASTM A335, Grade P22, Schedule 160. Install new bolts and new blind flange to plug the holes.
6. Install new pressure line and testing line.  
*(Please note that the pressure switches down stream of CV's 3 and 4 are for performance test purposes (usually CV 3 feeds a top inlet and CV 4 feeds a bottom inlet). For the permanent pressure transmitters currently connected to first stage pressure, the pipe should be re-run such that following the retrofit these transmitters measure pressure after one of the control valves feeding a bottom inlet (CV 4). The performance test connection for pressure after CV 4 can then be 'T'ed from this line. It is not necessary to have permanent transmitters on each pressure tap or to 'T' them together. See the Unit 2's installation.*
  - Install double isolation valves on steam lead #3, after the CV, looking west, top pipe, right side) with welded cap and test port. (IPSC) After the isolation valves, connect it to one of an existing pipe below the HP shell that goes into the cabinet.
  - Install double isolation valves on steam lead #4, after the CV, looking west, bottom pipe, right side) with welded cap and test port. (IPSC) After the isolation valves, connect it to one of an existing pipe below the HP shell that goes into the cabinet.
  - The test connections need to be ran to the test cabinet. Need to talk to Dave S and Dean W.
7. Weld thermocouple plates, 304 SS, 2 each, 1 on top, 1 on bottom, of the mid span, outer shells with CS angle supports. (Irwin)
  - Bottom thermocouple will run toward the RS, along the outer shell, under the insulation, to the platform then connect to the box.
  - Top thermocouple will run toward the GE, axially, between the two top steam leads, under the insulation, then connect to the box. The box will be support by allthreaded rod or angle that weld on the shell.
  - Thermocouples are 12' long, under Phong's office.

**IPSC**



INTERMOUNTAIN POWER SERVICE CORPORATION

**TURBINE QUALITY ASSURANCE PROGRAM  
UNIT 1, SPRING 2003**

---